update

UNITED NATIONS CENTRE FOR SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

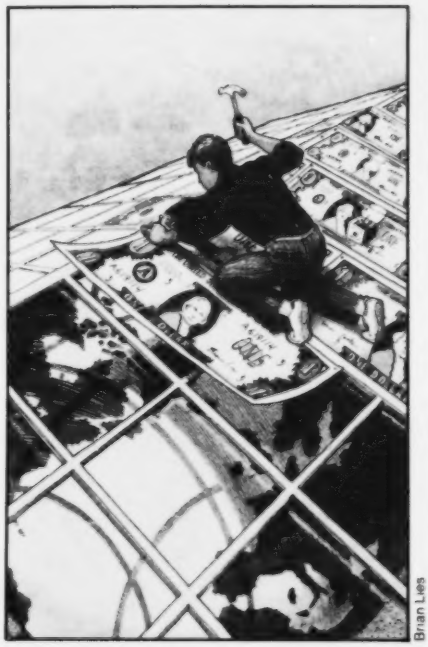
No. 44/Winter 1990/91

Menu for Environmentally Sound Development

More than 80 people from 20 countries attended a workshop on "Creative Financing for Environmentally Sound Technologies" in Belem, Brazil, from 2-7 December.

The participants were from financial, legal and scientific backgrounds and their discussions reflected general agreement that the environmental problems of today are essentially the product of yesterday's technology choices. The sustainability of future development efforts, they said, would hinge on the capacity of rich and poor nations alike to make better choices based on technology assessments which factored in the real costs of production—costs such as pollution, global warming and climate change—which future generations should not have to bear.

CSTD was directly involved in 11 international workshops, seminars and conferences, between April and December 1990, all of which focused on the need to give developing nations the capacity to weigh the benefits of technologies against their potential environmental and social consequences.



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The workshop addressed these concerns under four main headings: the atmosphere; the biosphere; the geosphere; and general financing; and arrived at a series of recommendations for further consideration and possible initiatives by the United Nations Conference on Environment and Development. That Conference will also be held in Brazil (June 1992).

Recommendations included the development of:

- International Environment Funds such as the $1.1 billion global environment facility of the World Bank, UNDP and UNEP. It has been proposed that this fund should have a strong technological component and that CSTD should provide conceptual support to its operations.
- Tradable permits and consumption rights, under which a global ceiling for a particular environmental concern, e.g., CO_2 emissions, is agreed upon by all nations and national quotas are allocated among them. Those who exceed their quotas could still remain legal if they would purchase their deficit from those who emitted less than their quotas.

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ATAS Explores Conversion

One of the many rationalizations offered for the appropriation of nations' prime scientific and material resources for the arms race was that the "fruits" of these investments would eventually trickle down as useful components of everyday life.

Some undoubtedly have, and the development of new materials would be an example. But with the end of the "Cold War", will that trickle become a downpour? Can we anticipate a flood of new technologies, new ideas? How will nations re-employ their military apparatus? How will they exploit the many opportunities implicit in the release of research institutions and researchers from the quest for new weapons?

In these early days of the political "Spring" there are obviously many uncertainties, and many more questions than answers, but CSTD felt it would be timely to present some thoughts on the conversion of military enterprises which were shared at United Nations Conferences initiated by the United Nations Department of Disarmament Affairs in 1990. Several contributions from those meetings in Moscow, and in Sendai, Japan, are contained in a special "Conversion" issue of ATAS News (inside). _____ ■

Menu for Sound Development
(Cont. from Pg. 1)

- Offset arrangements by which competing suppliers of goods and services to the developing world offer third world purchasers special incentives such as investment, trade, research, training, and technology transfers.
- Debt conversions, such as debt-for-nature swaps.
- Taxation mechanisms which give users and producers an incentive to respect environmental objectives. Examples include fuel taxes, fines, rebates and subsidies.
- Grants and donations for environment-related activities.
- Development assistance which integrates environmental concerns in aid projects.
- Market mechanisms, such as greenhouse investment funds and royalties, which encourage environmentally friendly behaviour.
- Regional development funds which address the protection of shared environmental interests such as river basins, regional deserts.
- Insurance and reinsurance plans. To minimize risks, insurance companies would promote knowledge and training related to environmentally sound technologies. Reduced premiums would be offered to clients who were interested in absorbing such a package.

The workshop recognized that each of the individual items on this "Menu" had its limitations, and proposed that the package be configured to the situation at hand. ■

Mini Hydro

The European Small Hydropower Association will hold its second international conference and exhibition on small hydropower technologies in Nice, France, from 12 to 15 June 1991.

For further information, please write to: Madame Ruth Ohler-Roux, Hidroenergia 1991, Agence Française pour la Maitrise de l'Energie, 500, route des Lucioles. Sophia-Antipolis 06565 Valbonne, Cedex-France. ■

Technology and Energy Supply in Brazil

By Jose Goldemberg

Dramatic increases in world oil prices in 1973 and 1979 led Brazil to increase its local oil production and to produce large quantities of ethanol from sugar cane, in what is generally regarded to be the largest biomass programme in the world. Both strategies required considerable technological advances. Brazil's large offshore oil reserves are located at depths in excess of 1,000 metres and the country has become one of the world's leaders in deep-water oil exploration. About 50 per cent of the oil derivatives consumed in Brazil are produced locally.

Brazil is a country with a well balanced energy supply mix. Its three main energy sources—electricity, biomass and petroleum—represent 92 per cent of the total primary energy consumed nationally, and 60 per cent of this energy is renewable.

Hydro Electricity

Hydro Electricity has become increasingly important in the country's energy picture, representing 16 per cent of the total in 1973 and currently more than 39 per cent. Before further development of this natural power source proceeds, however, further development of long distance transmission will be necessary, and additional studies are needed to evaluate the environmental impact of new dam construction.

Coal and Gas

Coal and natural gas play a small role in the energy supply mix. Coal use is restricted to the southern regions where the mines and thermo electrical stations are located. The quality of the coal is also rather poor and further technological developments will be necessary before further use of it is made. Local production of natural gas is still low.

Biomass

The most important area of development is in biomass. In the early 1940s biomass represented 70 per cent of the nation's total primary energy production in the form of fuelwood or charcoal. In 1973 fuelwood generated 50 per cent of the energy used nationally but by 1988 its share had been reduced to 22 per cent.

The production of alcohol (ethanol) from sugar cane has had a major impact on the energy picture. Ethanol's share of energy supply increased from 0.5 per cent in 1973 to 4.6 per cent in 1988 and bagasse generated twice this amount. Furthermore, the cost of ethanol production has declined at a rate of 4 per cent a year.

In addition to ethanol's environmental advantage (recent studies show that alcohol combustion releases only 5 per cent of the CO_2 produced by fossil fuels), alcohol is now competitive with gasoline when oil prices rise above $30 a barrel. And technological progress suggests that its production costs could be further reduced to 60 per cent of the present level. An opportunity for making alcohol even more competitive with gasoline resides in the use of bagasse for electrical energy co-generation. Present sugar milling capacities could deliver the equivalent of a 4000 to 5000 MW plant.

Another component of Brazil's energy policy is its emphasis on conservation.

The Brazilian experience with biomass clearly indicates the possibility of establishing sustainable patterns of growth through an appropriate mix of energy sources, the application of modern technologies and energy conservation. ■

Professor Jose Goldemberg is currently Secretary of Science and Technology in the Federal Government of Brazil and is the author of many technical papers and books on nuclear physics and energy in general. He is a former Rector of the University of São Paulo.

Oil Crisis Stresses Indian Economy

By R. K. Pachauri

The current oil crisis comes at a time when the Indian economy is already under considerable strain. Budgetary deficits have been increasing in recent years, and inflationary pressures, generally manageable, have shown some tendency to increase in recent months. Against this backdrop, the effect of current oil price increases is alarming, since demand for oil has been increasing sharply in recent years, while domestic production has remained stagnant.

In normal times, demand for oil products in the current fiscal year would have been between 57 and 58 million tonnes with only 32 million tonnes being produced indigenously. A price increase from $15 a barrel to around $26 to $27 a barrel implies an increase of about Rs. 30 billion (approximately $1.7 billion at current exchange rates) in the foreign exchange outflow in the current financial year. India's foreign exchange reserves are already at a low level, equivalent to only about 40 days of import requirements. The most important task, therefore, is to reduce dependence on oil imports.

When one considers options for reduced oil import dependence, there is not much that can be done in the immediate short term.

First, the railways have to create additional capacity whereby both freight and passenger traffic can be shifted from road to rail. This can only be partially achieved in the short term. Secondly, appropriate price increases could curb the demand for transportation, particularly of the non-essential kind. Beyond the transportation sector, there are several areas in which oil consumption is for stand-by purposes, as in the cases of captive power generation in industry, and stand-by diesel pumpsets for irrigation. In these cases an effort to improve power supply, reduction of transmission and distribution losses, an improvement in end-use energy efficiency, particularly through housekeeping measures, would constitute a viable strategy. While these steps would provide some immediate relief, the basic challenge for India is to promote co-generation in industry, greater use of natural gas and accelerated R&D for renewable forms of energy, particularly those based on the use of biomass.

These steps should be seen only as a way of minimizing the adverse impact of current uncertainties in the oil market. They would certainly not be sufficient to solve the total energy problem confronting India. Improved energy efficiency is an imperative.

In recent years, India has been investing around 30 per cent of planned public sector outlays in the energy sector alone, but with present growth in demand, this share of investments will not suffice. Better demand management is essential.

In the immediate future, therefore, policy makers in India should direct their attention to improved energy efficiency, while the international community addresses the present crisis with a substantial increase in resource transfers. ■

Dr. R. K. Pachauri is the Director of the Tata Energy Research Institute of India.

Deep-Seated Problems in Latin Power Sector

By Gabriel Sanchez-Sierra

The power subsector of the Latin American and Caribbean countries is experiencing a difficult financial situation which shows no prospects for improvement in the short term. Most power utilities in the region are finding it difficult to service their debts and even to meet their operating costs. This seriously constrains their ability to invest.

The strategic role of the subsector, given its importance for social and economic development, makes it necessary to seek a solution to its financial crisis, which seriously threatens electricity supply for the immediate future.

The causes behind the crisis, many of which still prevail, were numerous and varied in the different countries of the region. Generally speaking, factors have been endogenous, inherent to the energy sector itself, and exogenous, tied to national economic policies and changes in the international economy.

Endogenous factors have included insufficient generation of operating surpluses due to tariff lags, operational inefficiency, heavy dependence on foreign resources, poor planning, and institutional problems.

The domestic economic situation and economic policies have also impacted the sector: the prevailing recession, massive devaluations of national currencies, accelerating inflation and fiscal/financial imbalances decrease companies' real income and transfers from the Government and other sectors, making their debt service and equipment/parts imports even steeper.

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International economic evolution has also markedly affected the quality and flow of external financing and caused the currencies of the sector's debts to fluctuate constantly.

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Latin power problems
(Cont. from Pg. 3)

Recognition of this reality and the outlook for its major variables demands prompt application of a set of guidelines covering the subsector's internal operation and management of its finances in the prevailing national and international context. Some financing strategies are summarized below:

Subsector Policy

To improve internal cash generation and investment policy, decisive action must be taken on several fronts:

—Tariff policy
—Recovery of portfolio and control of non-technical losses
—Operating costs (improvement of management efficiency and modernization)
—Appraisal of users (socio-economic and physical conditions)
—Investment programmes (rationalization)
—Institutional framework

Domestic Economic Policy

—Capitalization of public enterprises (those with the greatest debt and worst financial standing)
—National financing agencies (specialized to procure domestic resources for the power subsector)
—Tariff structure (to keep revenues growing apace with inflation)
—Private investment to complement public funding (without losing sight of potential drawbacks)

External Financing Policy

International lending agencies:
—Achievement of positive or at least zero net transfers
—Restructuring of current debt
—Improved borrowing conditions: interest rates, amortization terms, grace periods and compensation for exchange-rate risks
—Increased emphasis on subsector loans

Commercial banks:
—Re-structuring of current debt
—Secondary-market and overall debt-reduction

Regional Co-operation

—Project execution (counter-trade in goods and services)
—Power grid inter-connection (neighboring countries)
—Bilateral or subregional financing agencies ■

Gabriel Sanchez-Sierra is Executive Secretary of the Latin American Energy Organization (OLADE).

Lanzhou Seminar

The Peoples Republic of China hosted an international seminar on desertification (25 June-3 July) in co-operation with CSTD, the State Science and Technology Commission and Gansu State Science and Technology Commission. Financial support was provided by IDRC, GTZ and SAREC.

Six countries

Six participants from China, India, Israel, Mongolia, Tunisia and Zimbabwe presented their country experiences, and one participant from Burkino Faso spoke on behalf of the Permanent Interstate Committee for the fight against drought in the Sahel (CILLS). The World Meteorological Organization (WMO) also participated in the meeting. Discussion focused on, among other things, the need to encourage: data collection; bilateral cooperation among contiguous countries; pilot projects; and environmental education and local awareness.

The seminar also discussed the value of establishing a multidisciplinary desert research institute or unit with university or quasi-university status. ■

Nuclear Energy Evaluation Considers Oil Savings

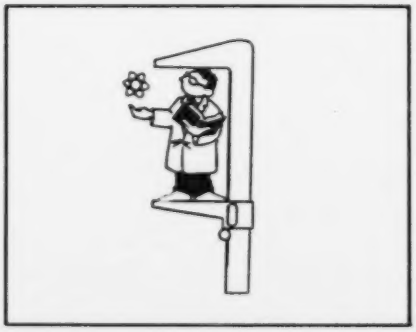
Energy analysts in the United States report that nuclear energy has played a major role in the reduction of global oil use for electricity production.

Science Concepts Inc. of Washington D.C. has produced a detailed retrospective evaluation of all the fuels which would have been expended to generate electricity if nuclear-power plants had not been built. Its analysts maintain that between 1973 and 1989 nuclear energy replaced the burning of 15.5 billion barrels of oil world-wide.

Oil savings

The group reports that oil generated more than 25 per cent of the world's electricity in 1973, but the expanded use of the nuclear option had cut that share to 10 per cent by 1989. According to the analysis, nuclear energy in 1989 directly displaced almost 6 million barrels of oil a day, and a yearly total of 3.3 trillion cubic feet of gas, and 200 million tons of coal.

For further information: please write to Science Concepts Inc., 1776 Eye Street N.W., Suite 850, Washington D.C. 20006, U.S.A. ■



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Offsetting the High Cost of Military Spending

Scores of developing nations maintain large armies and arsenals at the expense of their people's economic and social well-being. The results are reflected in the absence of basic services, widespread poverty, and low levels of nutrition and health which cost millions of innocent lives every year. The poverty reinforced by this skewed budgetary priority is also mirrored in environmental destruction caused by the desperate clearance of forests and woodlands for fuel and land for agriculture.

There is little evidence that these practices will abate, in the short term at least, although it has been suggested that disarmament at the level of the super-Powers and European nations should yield a "peace dividend" to the developing world in the form of aid monies released from military savings. There is also a risk, however, that the "peace dividend" might evaporate as fiscally imbalanced industrialized nations use this opportunity to balance their books instead.

UN Photo

"They shall beat their swords into ploughshares..." Isaiah

Offsets

It is not necessary for developing countries to wait on such an uncertain prospect. Many countries have been offsetting their foreign exchange losses for military purchases by obliging suppliers to enter into separate agreements which effectively transfer some of the costs to the marketing overhead of the successful bidder. These "offsets" have included help to find foreign markets for national products, the transfer of technologies and direct investments and partnerships between technologically advanced foreign companies and local enterprises. Arrangements of this kind have led, on average, to the return of 60 per cent of the procurement budget to the local economy.

Some countries have also committed bidders for military supply contracts to apply their managerial and technical skills to environmental protection—an approach which was further developed in a proposal by Mr. Amin C. Badr-El-Din to a seminar on Creative Financing for Environmentally Sound Technologies, held in Brazil last December (See also *Update* article, Page 1).

Mr. Badr-El-Din proposed the establishment of an "Offset Environmental

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New Concepts Of Security Take Root

The super-Powers' first tentative steps towards disarmament have fuelled discussion in the United Nations of the need to redefine "national security". The search has begun in earnest for a more comprehensive concept of security which extends beyond military concerns to embrace such things as economic well-being and sustainable development. The language of the cold war is giving way to a more temperate global dialogue which recognizes that poverty and environmental degradation also carry the seeds of long-term instability, tension and conflict.

The present widespread process of national economic restructuring, including, most recently, the experiences of Eastern European countries, offers a unique opportunity to emphasize the importance of technology assessment in decision-making, and particularly for those choices which will have an impact on the environment.

This realization has found expression on many fronts, and when politicians speak of collective security these days they might well be speaking of the quality of life in developing countries, the need to make technologies more accessible to all, or global interdependence reflected through multinational or transnational trade. Overall, there are signs of a new willingness to share the bill for peace. One recent example is the suggestion (see story opposite) of an environmental peace dividend. Others are reflected in the signed articles which follow in this issue of ATAS News. _ ■

Technological Change and Global Society

By Yasushi Akashi

Rapid technological change is viewed by many with a mixture of hope and apprehension. On the one hand, we yearn for progress. We want the best for ourselves, our families, and our societies; and the tools of modern technology have done wondrous things to improve the material conditions of life for many. Yet change can also be very unsettling, all the more so when the instruments of advanced technology are beyond the comprehension of most people.

In our collective struggle against the age-old afflictions of mankind such as disease, poverty, hunger and ignorance, the role of scientific progress is evident. But what of the more subtle challenges? Can we foster true human values in the face of increasing social alienation? Can we achieve self-fulfilment, cultural identity and social stability in an age of consumerism, mass communications and cosmopolitanism?

A generation ago such questions were seldom asked. In many parts of the world there was unbounded optimism regarding the capacity of advanced technology to solve human problems. Today, as we look beyond the cold-war era, there is again a widespread sense of optimism, but I think on the whole we are wiser and perhaps more humble.

In rather different ways, the tragedies of Challenger, Chernobyl and Bhopal offer stark reminders to us that progress is painful. It cannot be taken for granted. Many people today see modern technology as a complicating factor in social development—something to strive for, but certainly not a panacea.

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Those of us in the political world are keenly aware of how much we rely upon sound scientific advice in making public policy choices. Of course the obverse is equally true. Scientists and technologists can ill afford to ignore politicians. There is no escaping this complex interdependence. Scientists and politicians are unavoidable partners; we need each other; indeed, we are hostages to each other. This poses certain problems, most acutely in matters of peace and security.

Public participation

The first problem concerns the issue of informed public debate on complex technical matters of far-reaching social significance. Nearly 30 years ago, C. P. Snow warned of the hazards of cloistering the "cardinal choices" of societies among a very few officials "who cannot have a first-hand knowledge of what those choices depend upon or what their results may be".

In many parts of the world there is an unmistakeable yearning for greater democratic expression and public participation. Local communities worry about the ecological and economic consequences of rapid technological change. Naturally, people want greater control in shaping their destinies, and they are not content to leave critical decisions in the hands of a scientific-political élite. This, surely, was the significance of the nuclear freeze movement of the early 1980s, just as it is with the environmental movement of today. The question for us is not whether to have such a debate, but how to frame it in an intelligent and constructive manner.

The second problem revolves around the issue of personal responsibility. All of us attach fundamental value to scientific progress. Throughout history our best minds have applied themselves to learning the rational laws of nature, endeavouring to push forward the frontiers of knowledge. Yet it is equally true that the search for knowledge cannot be neatly separated from concerns regarding how the fruits of discovery are applied. The problem is how to act upon this concern without being paralysed by it.

Nuclear threshold

In 1945, mankind's first steps across the nuclear threshold were prompted by the fight against facism, fanaticism and militarism. It was not a time for calm reflection. In the wake of Hiroshima, Nagasaki and all that followed, many of those engaged in that enterprise felt as if they had mortgaged their souls in learning the secrets of the atom. It was a bitter experience for many. Most of the everyday choices that scientists face are not nearly as consequential or Faustian in their dimensions as that. Still, there is no escaping the predicament that choices have numerous consequences, unintended or not.

The proper lesson here is not that we should suppress the scientific spirit. Rather, it is to recognize the absolute need to think through the far-reaching implications of important technological developments and to respond to them intelligently.

Global perspective

The cold war is thawing before our eyes. New opportunities for multilateral co-operation are coming into view. The prospects for accord among the major Powers have never been greater in 40 years. Moreover, a global perspective is slowly emerging—one that sees "national security" as a goal to be pursued, not at the expense of other nations, but rather in concert with them.

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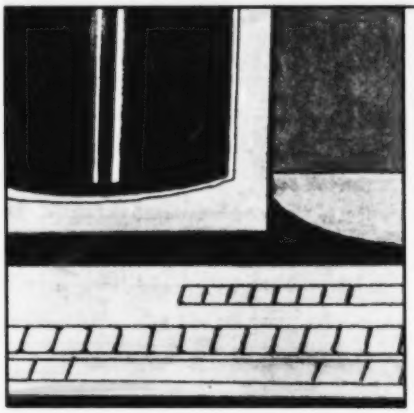
Development Fund" to collect 10 per cent of all global offsets to be used for environmentally sound development, including reforestation, education and R&D in developing countries. The potential annual input to a fund of this kind has been estimated at $25 billion.

The implementation of this proposal would require a phased approach starting at the regional level and building gradually into a global offset facility. ■



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Perhaps the greatest danger in our present situation is complacency. It would be very unfortunate if the past naïveté of societies regarding science were reborn in the form of unbridled optimism regarding the progressive tendencies of political development. We have not reached the end of history. Rather we are entering a new, more complex and no less dangerous phase of history.

Great risks ahead

Political change is a disorderly process. As the East-West confrontation recedes, we are seeing a resurgence of nationalism and ethnic and regional strife in many parts of the world. The risks of regional conflict are great; military budgets and arms transfers in the developing world are growing; and the gap between rich and poor countries is widening at an alarming rate. These, surely, are the ingredients for instability. We must be on guard against them. ■

Yasushi Akashi is the United Nations Under-Secretary-General for Disarmament Affairs. This article is extracted from a statement to the United Nations Conference on "New Trends in Science and Technology: Implications for International Peace and Security", held in Sendai, Japan, in April 1990.

Conversion — Dilemmas and Dividends

By Essam El Din Galal

It is remarkable that Niels Bohr, one of the most prominent physicists of our time and a major pioneer of nuclear fission, was also among the first to realise in the 1940s that a new scientific and technological revolution necessitated a parallel socio-political revolution.

It is perhaps also remarkable, therefore, that it should have taken the world half a century to begin to deal, tentatively and confusedly, with the need to convert an exaggerated military industrial complex to more constructive and much needed civilian uses.

Dilemma

The terms of reference for conversion have been radically changed, however, by recent upheavals in the Warsaw Pact countries, and by the radical reductions in military expenditure and deployment still being negotiated and unilaterally taken. Conversion in the Warsaw Pact countries is more of a technical and economic dilemma than a military one, particularly at the production level, even though arms trade may develop to be the more accessible and lucrative export market if economic rehabilitation does not proceed more promisingly.

In the West, economic and political dictates do not urgently or decisively work towards the same goal. In the

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growing economy of the post Second World War period, the supply and demand requirements of conversion were favourable and so were shifts in the employment market. But in the current world economy, the incentives to meet the cost of conversion at the macro-economic as well as the corporate level are problematic. This is amply illustrated by the share of military contracts held by large corporations in 1986 as a percentage of their overall operations: General Dynamics, 87 per cent; Grumman, 86 per cent; Lockheed, 55.5 per cent. Disincentives can be seen among other ranking corporations of the American economy as well: General Electric, sixth in size with a 19.4 per cent military component; Boeing, 16th with 16.3 per cent; United Technology, 17th with 15.6 per cent. One should not be surprised, therefore, to see a lag in the adjustment of the industrial military complex to the rapidly changing global military and political scene. Although resistance may be a factor, among others, hindering drastic disarmament, one has to presume, however, that conversion will ultimately have to catch up with the events still unfolding.

Peace dividends

Conversion does not at this juncture appear to represent a direct conduit for capital and trade, or aid, to developing countries. Nor does it seem to promise a reduction in the arms trade to the third world. On the other hand, indirect benefits in the form of global economic growth, freer and expanding civilian trade, and transnational extension of industrial production could ultimately be stimulated.

One of the most important aspects of conversion is the transformation of military R&D. In the 1980s military R&D amounted to 70 per cent of the total Federal expenditures on R&D in the United States, and about 30 per cent of those in France and the United Kingdom. By Western estimates, about 50 per cent of the scientists and engineers in the Soviet Union were connected with military R&D. A number of third world countries, including

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Conversion

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Israel, South Africa, India, Brazil, Taiwan and South Korea, have shown similar tendencies towards heavy military R&D investments, but their costs will also be high. Not only is growth and development denied the best brains, facilities and resources, but the orientation, priorities and values of the scientific and technological élite of our civilizations are being distorted and dissipated. The flow and diffusion of knowledge and achievement is also being hindered.

Suspicions remain

The obstacles to conversion are formidable. Not only do military and expansionist interests continue to hanker for superiority, even under the umbrella of détente, but the suspicions ingrained in the global system threaten reversals to the worst scenarios of warfare.

Unlike production, research and development are not easy to monitor or to verify. Moreover, the division between civilian and military R&D is not clear cut, except in larger systems at the stage of application and testing.

The peace constituency?

The dependence of industrial corporations on government R&D expenditures, and the rewarding employment prospects inherent in the system, help to create an unfavourable constituency for conversion. So, too, in all probability, will the demand for institutional readjustment, new production linkages and changed values and market forces.

The process of conversion could be greatly enhanced if it were incorporated in negotiations for disarmament as well as those for development cooperation, and for environmental and climatic safeguards. These linkages are not only logical but politically promising. One major handicap to conversion at the present time is its status as an "orphan". Its only serious advocates are peace movements and genuine disarmament experts. The importance and potential of conversion justifies much broader support, and this could well come through linkages with other global concerns. ■

Essam El Din Galal is former Chairman of the UN Advisory Committee on Science and Technology for Development, former Advisor to the President of the Egyptian Academy of Scientific Research and Technology, Cairo. He is also Executive Committee Member and Convener, Pan African Groups, Pugwash.

Report on Technology Missions

"Technology Missions" were the subject of an expert panel of the United Nations Advisory Committee on Science and Technology for Development in Serock, Polayd (11-14 September).

One focus of the meeting was the presentation and analysis of seven case studies—India, Brazil, China, the Republic of Korea, Jamaica, the West Africa region and Italy. The studies highlighted the importance of technology missions as a means of harnessing national scientific and technological potentials and using them to implement social and economic goals.

The West Africa study provided details of an extraordinarily successful campaign to control the black flies which transmit onchocerciasis, also known as 'river blindness', in rural communities near the waterways of 11 countries of the region. Fear of the disease, which causes progressive blindness, devastated rural economies as fly infestations forced people to abandon well-watered lands for the less fertile reaches of the valleys.

The co-ordinated use of chemicals to interrupt the breeding cycle of the fly, and the introduction of a drug, Ivermectin, which kills the microfilariae, the cause of blindness in humans, has enabled populations to return to their abandoned villages and farm in safety. ■

Professional Ethics in the 1990s

Professional ethics in the 1990s will be the subject of a seminar in Washington, D.C., on 2 February 1991.

The seminar, hosted by the American Society of Mechanical Engineers in co-operation with the National Association for Science, Technology and Society, will explore a variety of ethical dilemmas facing technical professionals from corporate and academic perspectives.

For further information, please write to Mr. Robert Meredith, Conference Manager, NASTS, 122B Willard Building, University Park, PA 16802. Tel. (814) 865-9951.

An Urgent Need to Share Fruits of Technology

By George E. Brown Jr.

The 747 "Jumbo" jet and the "Bullet Train", now taken for granted in much of the world, are light years away in technical sophistication from the instruments of everyday life for more than a billion people on this planet. For those who live in abject poverty, food, water and personal health are urgent security concerns. At the present time, some 40,000 infants die in the developing world each day as the result of severe nutritional stress and infectious disease. Seven out of ten new-born babies in Mexico City have lead concentrations in their blood that exceed World Health Organization standards world-wide, and more than 2 billion people drink and bathe in water contaminated with parasites and pathogens, which explains in part why life expectancies are actually dropping in many African nations.

Improved security for these people will not come as a result of breakthroughs in biotechnology, nuclear science or materials research, but a marked improvement could come about through greater access to such simple technologies as plumbing, refrigeration and vaccinations.

Basic Needs

Those who live on the margins of our high- technology society, who are desperate for the most basic necessities, are forced to place inordinate burdens on their immediate natural environment. This poverty drives ecological deterioration as the world's poor over-exploit their resource base in an effort to survive. With no alternative means of cooking, they are forced to gather firewood from their immediate surroundings, thus causing forests to recede farther and farther from their communities. In search of a means of income, they clear-cut tropical rain forests for slash and burn farming, which lasts but a few growing cycles before additional plots need to be cut.

Ecological decline in turn perpetuates poverty, as degraded ecosystems offer diminishing yields to their inhabitants. The result is a self-reinforcing downward spiral of economic degradation and environmental damage.

Sharing technology

The distribution of technology in some of its most basic forms to the world's poor is urgently needed, as it has been for decades. It now assumes even greater urgency, however, since the process of economic growth in the developing nations—if based on CFC-emitting refrigerators, carbon-spewing vehicles, energy-wasting appliances and pesticide-dependent crops—will lead to environmental damage that overwhelms all efforts on the part of the developed nations to curb their own polluting practices. The industrialized nations need to act now to help the developing world achieve economic prosperity and environmental protection through the introduction of sustainable technologies at the beginning of this industrialization process, and these industrialized nations must demonstrate their commitment to global environmental security by their own rapid action in adopting these sustainable technologies and making them available under equitable conditions to all newly industrializing nations.

More than technology

In many ways this is the biggest challenge of the so-called "post-cold-war" period. Science and technology will play important roles, and in some ways analogous roles to those they have played during the cold war. We shall be marshalling the power of technology to protect against threats of ominous, yet uncertain, dimensions. And also, as in the East-West military confrontation, we shall need to marshall our skills at international diplomacy and global co-operation. Just as technology did not resolve the threat raised by political and ideological differences between the United States and the Soviet Union, technology alone will not solve the world's serious environmental and economic problems.

The United Nations will have a vital role to play in helping bring nations together to reach international agreements governing environmental activities. It is already playing this role in working towards an international convention on stabilizing greenhouse gases. Such agreements may need reinforcement and verification provisions not too dissimilar to those contained in treaties restricting military technologies. ■

IDRC

Improvements can come through access to simple technologies.

George E. Brown Jr. is a Member of the United States Congress. This article was extracted from a statement to the United Nations Conference on "New Trends in Science and Technology: Implications for International Peace and Security", held in Sendai, Japan, in April 1990.

Measuring Prospects After the Thaw

By Vladimir Petrovsky

However one assesses the past, today's security is increasingly aligned with the arms reduction process and not with any unbridled buildup. Today's security is more and more associated with the transition to defensive doctrines and a corresponding restructuring of the armed forces. It is necessary to establish regional security structures, based primarily on controlled, transparent political and legal containment, and not on military deterrence.

Against this background, lack of readiness on the part of some States to make significant changes in their ways of using science and technology in the military sphere appears anachronistic. Practical efforts in this area, which determine the military tomorrow, are so far based on the political permafrost of yesterday.

Disarmament technologies

Of course there are and will be many problems along the way to what can be described as military and political conversion. This is largely an unexplored land, and a problem which requires a philosophy and actions fertilized with new thinking. Paradoxical as it may seem, in the very near future the interests of creating peaceful conditions will even call for research and development programmes in the military field. I am referring to the need for developing special disarmament technologies. In particular, there is a growing demand for verification and control technologies, methods of detection and effective systems that ensure confidence in compliance with agreements being elaborated in the area of arms limitation and reduction.

Verification

Generally speaking, we need to answer the following question: Is there a risk that, as a result of military and technological rivalry and the miniaturization and growing sophistication of weapons, the disarmament process will grind to a halt over verification problems? For example, numerous difficulties arose at the Strategic Arms Reduction Talks (START) in elaborating measures to verify existing types of systems, including problems with cruise missiles.

Disarmament art

The emerging international art of disarmament thinking is already yielding its first results in terms of verification procedures for a number of complex technical problems. It is significant that underlying these technical solutions are primarily political decisions that provide for maximum co-operation among the parties in conducting verification, readiness to adopt measures to facilitate verification, including the introduction of special technical means, and openness in the military sphere. A new development is the practice of conducting joint experiments and trial inspections, in other words, trial runs of verification techniques on a preliminary basis already at a phase of the elaboration of specific disarmament agreements.

Relying on S&T

An important aspect of the current period is the emerging tendency for the economics of disarmament to seek out the most effective ways to achieve conversion. It is clear here that we cannot do without relying heavily on science and technology, just as we cannot do without converting science and technology themselves.

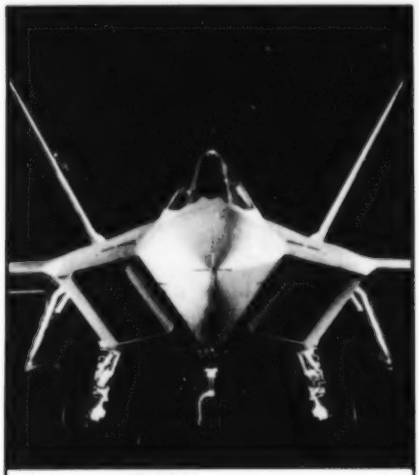
Economic dividends

In particular, we need to form some idea of the possible economic peace dividends, decide on the most effective forms and methods of using the financial material and intellectual resources released from the military sphere, and devise a strategy for developing relevant enterprises, companies and entire sectors of the industry.

Conversion under way

In our country, conversion of certain production facilities is already under way and the process is gaining pace. Our target is that by 1995, 60 per cent of the overall production in the current military-industry sector should be of goods for the national economy. I will not conceal the fact that the implementation of these tasks is running into a number of difficulties. This is a new area and an integrated approach is called for to address all the problems that arise here. I believe that everybody will reap an economic benefit from pooling the efforts of different countries, sharing their experience and establishing broad multilateral co-operation.

In our age, science and technology are becoming an inherent element in the comprehensive search for a new, post-confrontational system of peace, security and co-operation.



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United Nations

In our opinion, the United Nations, together with its family of specialized agencies, is called upon to play a major positive role in finding approaches in this area, commensurate with the challenges of our age. Scientific and technological progress, especially on the eve of a new millenium in the history of mankind, must serve only to enhance international peace and security and, ultimately, to enable everyone to live a full and worthy life. ■

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Facing the Realities of Military Conversion

By Alexei Izyumov

Soviet military conversion is not without precedent. There were sizeable cuts in army and military spending in the 1920s, after World War II, and in the late 1950s and early 60s. In each of these cases, the conversion of military production to civilian uses gave an additional boost to the economy and helped raise people's living standards.

The times, however, have changed, and the current conversion, implemented against a backdrop of economic crisis and radical reform, can hardly draw on the recipes of 30 to 50 years ago.

For the Soviet Union, the modern stage of its economic conversion started on 7 December 1988, when Mikhail Gorbachev addressed the United Nations General Assembly in New York. He called for the radical demilitarization of the world economy and announced that the Soviet Union was going to start with a unilateral conversion of its military economic base.

His words were followed by deeds. In January of 1989, the Soviet Government announced a dramatic unilateral reduction in the size of the Soviet military budget and military production by 14 per cent and 19.5 per cent, respectively, in two years (1989-1990). At the same time, the Soviet Union continued its efforts in the area of disarmament that led to the conclusion of important Soviet-US treaties on nuclear and chemical weapons, and opened the way for the radical reduction of the conventional armed forces in Europe and Asia.

The prospect of the demilitarization of the Soviet economy created by the latest successes of disarmament has been a welcome development for the overwhelming majority of the Soviet people. But the task of translating these successes into practical economic benefits has turned out to be much more difficult than expected. Contrary to expectations, the centrally planned Soviet economy has proved to be not very well prepared for the efficient large-scale conversion of the military economy.

Unlike western countries, where the defence industry plays a relatively

Christopher Fauver

modest role, it holds a pride of place in the Soviet economy, consuming the lion's share of its best manpower and material, scientific, technological and financial resources. If military spending accounts for less than 6 per cent of GNP in the United States, 3 per cent in West Germany, and 1 per cent in Japan, its share in the Soviet Union is officially 8 per cent. Soviet officials admit that up to 40 per cent of machine-building output and 75 per cent of research and development are defence related. The official Soviet budget puts military expenditures for the current year at 70.9 billion roubles, but experts working for the Committee on Science and Education of the Supreme Soviet, including the respected scientist heading that committee, Academician Yuri Ryzhov, estimate that total Soviet defence spending is closer to 200 billion roubles or more than 20 per cent of GNP.

Until the real conversion began in 1989, some Soviet economists had expressed the hope that the planned nature of the Soviet economy would be an advantage in fulfilling the massive reallocation of resources from military to civilian uses. They argued that since the Soviet economy is a planned one, its military sector could be easily redirected to civilian production. Theoretically it is of course true that a centralized economic system is better equipped for the implementation of large-scale economic programmes, but in the case of the transformation of the modern military economy, the plan doesn't seem to work better than the market.

There are three basic reasons for that. First, the Soviet economy of today is a much more complicated and sophisticated organism than it was in World War II. Converting it to civilian ends, therefore, is a much more complicated task, demanding more than a simple administrative decree. Secondly, in contrast to the military industries of the West, which usually interact with their civilian counterparts, most Soviet military enterprises are still separated from the rest of the economy by ultra high barriers of secrecy. In the past, that internal iron curtain prevented the full realization of the "spin off" effect of military technology. Now it stands as a major obstacle to the conversion of military industry.

Finally, the task of converting the Soviet military economy to civilian ends is made more difficult by the sheer size of military production and research. On a microeconomic level, that translates into a situation in which many more individual enterprises depend totally or almost totally on military orders and therefore do not have proper experience in the civilian markets. All in all, it would be fair to say, therefore, that the heavy dependence of Soviet military producers on defence orders, the overcentralized nature of their operations, and their relative isolation from the rest of the economy, make the task of conversion in the Soviet Union more difficult than in the market economies of the West. ■

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This article was extracted from a paper entitled "The National Experience of the USSR", presented at the United Nations Conference on Conversion (Moscow, August 1990).

Modest Fallout Expected from Reduced American Arms Budget

By Robert M. Rauner

In late 1989, the United States Secretary of Defence, Richard B. Cheney, announced his intention to cut billions of dollars from future defence budgets. In short order, media and some politicians were interpreting this potential defence reduction as underwriting a "peace dividend" that could variously be used to replace the nation's depreciated infrastructure, attend to a number of human social needs and also reduce the massive Federal deficits that had accumulated during the 1980s. Almost at the same time as the Secretary's announcement, dramatic upheavals in Eastern Europe confirmed the end of the Cold War, the logic of earlier arms initiatives and the opportunity to move pointedly towards further defence reductions.

10 p.c. cut

The defence budget announced by Mr. Cheney in January 1990 anticipated a net real reduction of approximately 10 per cent by 1995. The policy questions posed by this reduction were: are existing programmes of assistance to displaced workers and affected businesses sufficient in form and amount, or are the proposed reductions so large as to require new programmes for adjustment assistance?

In 1988, United States defence activity accounted for approximately 6.5 million persons or 5.7 per cent of total national employment of about 115 million persons. Of the 6.5 million, roughly 2.1 million were active duty military personnel, about one million were Department of Defence civilian personnel, and the remaining 3.4 million were defence industry workers at prime and sub-contractor plants, along with the other indirect workers they sustained.

Unemployment

In broad terms, a 10 per cent reduction in defence-related industrial direct and indirect employment will make about 340,000 workers vulnerable to displacement.

Defence contractors

The complexity of defence-related industry can hardly be underestimated, although the popular view holds that it is monolithic, single-purpose, unwieldy, and exclusively configured to produce defence equipment and material. At the present time, the United States Defence Department is served by about 30,000 prime contractors who receive contracts worth $25,000 or more. In fiscal year 1988, they ranged from the McDonnell Douglas Corporation of St. Louis, Missouri, with $8 billion in prime contracts, down to the $25,000 awarded to Automated Prescriptive Systems Inc. of Pineville, Louisiana. Over 200,000 individual contract actions were completed in that year.

Manufacturing dispersed

While some industries are almost exclusively defence-related, e.g. tanks, missiles, and ordnance, most others mix defence and non-defence production. For example, a United States Bureau of Census report on a large sample of 6,400 manufacturing plants making shipments to the Federal Government, found that only 855,000 workers out of 5.44 million (16 per cent) were defence related.

A recent survey of 97 defence-related small businesses in the State of Ohio found that 80 per cent of the firms had less than 100 employees and that 77 per cent were from the manufacturing sector. Fifty-four per cent of the firms had gross sales of $5 million or less. Most of their contracts were for one year or less; 10 per cent of the firms were prime contractors, 37 per cent sub-contractors, and 46 per cent, both. To summarize: most defence-related businesses have non-defence work, but much defence work is in a relatively small number of manufacturing industries. There is dispersion among States doing defence-related work, but 20 per cent of the States have 65 per cent of the prime contract awards.

The principal conclusion drawn from these analyses was that the additional burdens appear to be generally marginal and do not call for major revision in Federal assistance programmes. Economic adjustment to military cutbacks entails either a military base closure or realignment, or a plant shutdown or contract termination. ■

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This article is extracted from a paper entitled "Defence Budget Reductions and Regional Economic Adjustment: The U.S. Experience", presented at the United Nations Conference on Conversion (Moscow, August 1990).

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